

ARIZONA CTE CAREER PREPARATION STANDARDS & MEASUREMENT CRITERIA

| BIOSCIENCE, 41.0100.00 | |
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| STANDARD 1.0 – MAINTAIN A SAFE WORK ENVIRONMENT | |
| 1.1 | Employ knowledge of personal protective equipment (PPE) |
| 1.2 | Practice emergency protocols |
| 1.3 | Apply knowledge of material safety data sheets (MSDS) |
| 1.4 | Practice sanitation procedures |
| 1.5 | Perform routine maintenance of equipment |
| 1.6 | Maintain documentation of equipment log |
| 1.7 | Identify specific biological/biohazardous/chemical materials |
| 1.8 | Understand and respond to safety signs and symbols |
| 1.9 | Distinguish the characteristics of biosafety levels |
| 1.10 | Perform cleanup of biological/biohazardous/chemical spills |
| 1.11 | Monitor, use, store, and dispose of materials in compliance with regulations |
| STANDARD 2.0 – DEMONSTRATE UNDERSTANDING AND RELEVANCE OF STANDARD LABORATORY OPERATING PROCEDURES | |
| 2.1 | Identify compliances of federal, state, local, and industry regulatory agencies |
| 2.2 | Use industry terminology (i.e., cGMP, GLP, SOP, CIP, SIP) |
| 2.3 | Perform tasks according to protocols of standard operating procedures |
| 2.4 | Operate lab equipment according to SOP |
| 2.5 | Calibrate lab equipment according to SOP |
| 2.6 | Set up and maintain a legal scientific lab notebook |
| STANDARD 3.0 – DEMONSTRATE CRITICAL THINKING AND SCIENTIFIC PROBLEM-SOLVING SKILLS IN SCIENTIFIC INQUIRY | |
| 3.1 | Demonstrate appropriate observational skills |
| 3.2 | Identify tractable questions |
| 3.3 | Develop testable hypotheses and alternative hypotheses |

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| 3.4 | Frame testable questions showing evidence of observation and connections to prior knowledge |
| 3.5 | Test hypotheses utilizing appropriate experimental design (distinguish between controls and variables) |
| 3.6 | Collect, record, and analyze appropriate data |
| 3.7 | Support conclusions based on evidence |
| 3.8 | Communicate results of scientific investigations in oral, written, and graphic form |
| STANDARD 4.0 – DEMONSTRATE RESEARCH AND INVESTIGATIVE SKILLS | |
| 4.1 | Access and retrieve relevant scientific literature related to research topic |
| 4.2 | Develop a vocabulary of relevant scientific terminology |
| 4.3 | Utilize electronic databases to identify areas of peer-reviewed scientific research |
| 4.4 | Review the content of peer-reviewed articles |
| 4.5 | Produce a literature review |
| 4.6 | Evaluate prior research to drive further inquiry and experimental/research design |
| STANDARD 5.0 – DEMONSTRATE ETHICAL AND LEGAL CONDUCT IN JOB-RELATED ACTIVITIES | |
| 5.1 | Maintain legal and ethical guidelines to safeguard confidentiality |
| 5.2 | Maintain job responsibilities within the laws and regulations of federal, state, and industry protocols and procedures |
| 5.3 | Compare and contrast behaviors and practices that could result in malpractice, liability, or negligence |
| 5.4 | Examine the pros and cons of bioethical issues |
| 5.5 | Use risk management protocols such as incident reporting |
| 5.6 | Maintain code of ethics and organization's ethical protocols |
| 5.7 | Comply with legal, regulatory, and accreditation standards or codes |
| 5.8 | Adhere to standards for harassment, labor, and employment laws |
| STANDARD 6.0 – ADHERE TO QUALITY ASSURANCE PROCEDURES | |
| 6.1 | Investigate customer complains |
| 6.2 | Take corrective action according to SOP or as directed |
| 6.3 | Document actions and outcomes |

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| 6.4 | Perform trend analyses |
| STANDARD 7.0 – ADHERE TO QUALITY CONTROL PROCEDURES | |
| 7.1 | Perform quality test |
| 7.2 | Document results of quality testing |
| 7.3 | Verify test standards |
| 7.4 | Maintain QC records |
| 7.5 | Archive samples and documents |
| 7.6 | Release final product |
| 7.7 | Perform trend analyses |
| STANDARD 8.0 – UNDERSTAND THE ROLE OF LIVING ORGANISMS IN BIOSCIENCE RESEARCH | |
| 8.1 | Identify model organisms for research |
| 8.2 | Research the types of testing used in bioscience research |
| 8.3 | Understand the role of the proper care of living organisms |
| 8.4 | Maintain organisms for optimal growth |
| STANDARD 9.0 – DEMONSTRATE BASIC LAB SKILLS IN THE USE OF EQUIPMENT AND INSTRUMENTATION | |
| 9.1 | Use software/hardware for scientific analyses and documentation |
| 9.2 | Use scientific calculator to perform calculations |
| 9.3 | Identify, select, and use laboratory glassware |
| 9.4 | Identify, select, and use laboratory balances |
| 9.5 | Identify, select, set and use micropipettes |
| 9.6 | Identify select, calibrate, and use spectrophotometers |
| 9.7 | Identify, balance, and operate centrifuges |
| 9.8 | Describe and operate autoclave |
| 9.9 | Describe and operate fume/laminar flow hoods |
| 9.10 | Prepare microscopic specimens and interpret results |

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| 9.11 | Use hot plate/stirrers |
| 9.12 | Identify, select, and operate incubators |
| 9.13 | Identify, select, and operate water baths |
| 9.14 | Use a pH meter |
| 9.15 | Perform electrophoresis |
| 9.16 | Operate a PCR thermal cycler |
| 9.17 | Perform basic separation techniques |
| 9.18 | Operate chromatography equipment |
| 9.19 | Maintain control inventory for materials and supplies |
| STANDARD 10.0 – DEMONSTRATE UNDERSTANDING AND KNOWLEDGE OF CELL BIOLOGY TECHNIQUES | |
| 10.1 | Isolate and characterize cell lines |
| 10.2 | Propagate plant and animal tissue |
| 10.3 | Use cryogenic techniques |
| 10.4 | Use microscopes |
| 10.5 | Perform cytological tests, i.e. sectioning and staining |
| 10.6 | Perform bioassays |
| STANDARD 11.0 – DEMONSTRATE UNDERSTANDING AND KNOWLEDGE OF MICROBIOLOGY SKILLS | |
| 11.1 | Maintain workshop and equipment hygiene |
| 11.2 | Prepare, sterilize, and dispense media, buffers, solutions, etc. |
| 11.3 | Identify and quantify microorganisms and cells |
| 11.4 | Isolate, maintain and store pure cultures |
| 11.5 | Maintain and analyze fermentation materials |
| 11.6 | Harvest cells |
| 11.7 | Transform hosts |
| 11.8 | Perform bioassays |

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| 11.9 | Decontaminate and dispose of equipment, glassware, and biologicals |
| STANDARD 12.0 – DEMONSTRATE UNDERSTANDING AND KNOWLEDGE OF PROTEIN TECHNIQUES | |
| 12.1 | Detect specific proteins |
| 12.2 | Precipitate/solubilize proteins |
| 12.3 | Separate proteins, isolate or characterize proteins |
| 12.4 | Concentrate proteins |
| 12.5 | Perform protein assays |
| 12.6 | Describe the immunological technique |
| 12.7 | Identify genetic engineering and molecule biology techniques |
| STANDARD 13.0 – DEMONSTRATE KNOWLEDGE OF MATERIAL PREPARATION AND STORAGE | |
| 13.1 | Identify type of media |
| 13.2 | Identify uses of media |
| 13.3 | Prepare media |
| 13.4 | Store media |
| 13.5 | Identify solutions |
| 13.6 | Identify uses of solutions |
| 13.7 | Prepare solutions |
| 13.8 | Store solutions |
| STANDARD 14.0 – DEMONSTRATE USE OF BIOINFORMATIC RESOURCES | |
| 14.1 | Identify databases for sequence analysis (NCBI) |
| 14.2 | Utilize electronic databases/websites (NCBI) |
| 14.3 | Identify unknown sequences |
| 14.4 | Recognize relationships between sequences |
| STANDARD 15.0 – DEMONSTRATE UNDERSTANDING AND KNOWLEDGE OF NUCLEIC ACID TECHNIQUES | |
| 15.1 | Detect specific nucleic acid sequences |

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| 15.2 | Isolate nucleic acids |
| 15.3 | Perform restriction digests |
| 15.4 | Perform gel electrophoresis |
| 15.5 | Label nucleic acids |
| 15.6 | Perform nucleic acid sequencing procedures |
| 15.7 | Perform PCR procedures |
| 15.8 | Use sequence database |
| 15.9 | Perform basic genetic cloning techniques |
| STANDARD 16.0 – DEMONSTRATE UNDERSTANDING AND KNOWLEDGE OF SCIENTIFIC MEASUREMENTS | |
| 16.1 | Perform calculations and solve problems using arithmetic and algebra math skills |
| 16.2 | Perform basic mathematical calculations using scientific and engineering notations |
| 16.3 | Convert from the metric system to the English system |
| 16.4 | Perform measurements using temperature scales |
| 16.5 | Explain the acid base |
| 16.6 | Construct, interpret graphs, and apply graphs |
| 16.7 | Perform statistical analysis |
| STANDARD 17.0 – ENGAGE IN OCCUPATIONAL-SPECIFIC WORK-BASED LEARNING EXPERIENCE IN CHOSEN CAREER FIELD (E.G., BIOMEDICAL, BIOENVIRONMENTAL, BIO-INNOVATIONS) | |
| 17.1 | Develop a personalized professional portfolio that substantiates growth in chosen career field |
| 17.2 | Design and conduct original research in chosen career field |
| 17.3 | Participate in job shadowing, internship, mentor-mentee, entrepreneurial enterprise, or employment experience in chosen career field |